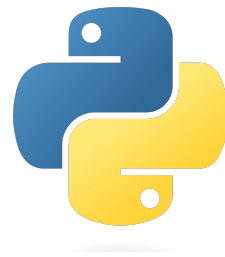


Introduction to Python

Python

- created by Guido van Rossum, and released in 1991
- **Programming Language** is a form of communication, that is used to instruct computer to perform some specific things. Example: Addition of two numbers.
- Python is a high level, interpreter based programming language which can be used in multiple field like Web Development, Artificial Intelligence, Networking, etc.

<https://docs.python.org/3/tutorial/index.html>





Features of Python

1. Free and Open Source
2. Easy to Read and Code
3. Object-Oriented and Procedure-Oriented Language
4. Dynamically Typed Language
5. Easy to Debug
6. Large Standard Library
7. Interpreted Language and many more ...



Runtime Vs Compile time

- Runtime is the time at which the executable code is started running
- Runtime errors can be:
 - Division by zero
 - Square root of negative numbers, etc

```
#include <stdio.h>
int main()
{
    int a=20;
    int b=a/0; // division by zero
    printf("The value of b is : %d",b);
    return 0;
}
```

- Compile time is the time at which source code is converted to executable code
- Compile time errors can be:
 - Syntax errors
 - Semantic errors

```
#include <stdio.h>
int main()
{
    int a=20;
    printf("The value of a is : %d",a);
    return 0;
}
```



Interpreter Vs Compiler

Tools that are used to convert source code to (user program) to machine code (assembly program) that computers can understand and process.

- Interpreter is a program that converts source code to machine code line by line when program is executed.
- At each execution, interpreter convert each line of user program to machine code, the process is slower.
- Example: Python, Ruby, etc
- Compiler is a program that converts source code to machine code in one go and generate executable file that can be run directly by the computer
- Compiler generates executable file, so it is faster to run compiled code than interpreted code.
- Example: C, C++, Java etc



COMPANIES





Python Installation Guide



- Windows
- Linux
- Mac
- Android
- ios
- Online code editor





Download Python Installer

- **Goto:** <https://www.python.org/downloads/>
- Download Stable **Python 3.x.x installer** appropriate to your system (64 bit or 32 bit)
 - Organizations are shifting their codebase from python 2 to python 3
 - However, Learning python 3, we will also know and able to learn python 2 syntax.



Python Installation on Windows

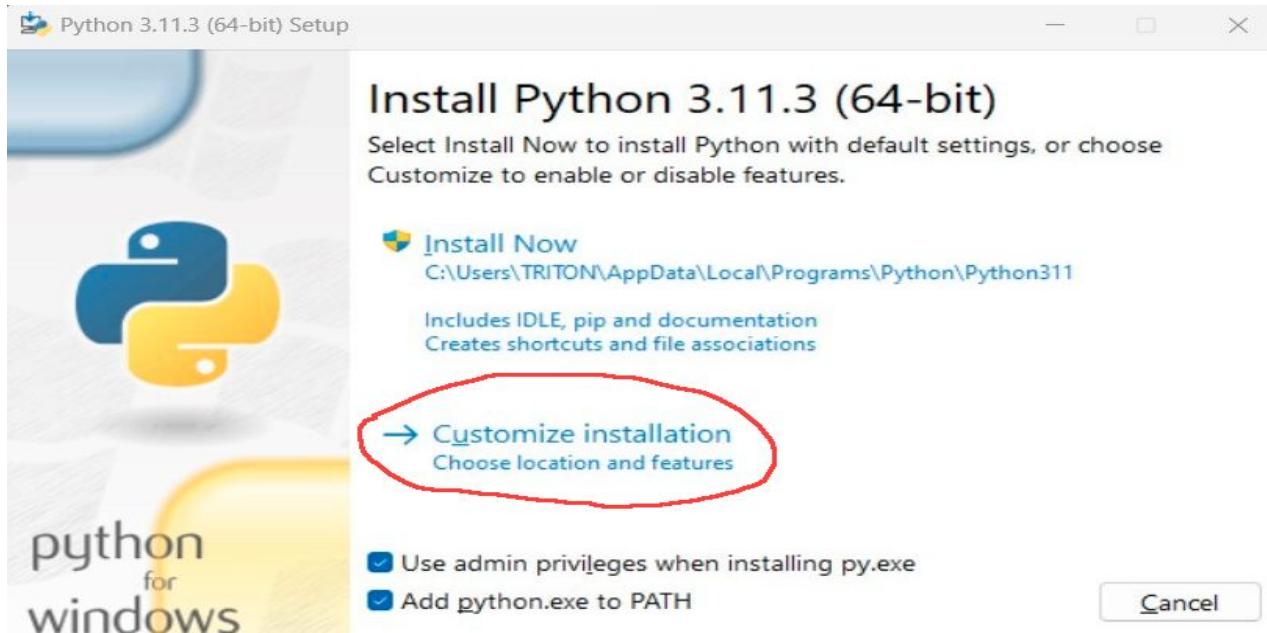
- Navigate to directory (Downloads) where the python installer is downloaded
 - DOUBLE CLICK to run python installer.
- In the Pop up window, Select Add **python.exe to PATH** checkbox as in below image. This allows us to launch python from command line.



Python Installation on Windows (CONTD...)



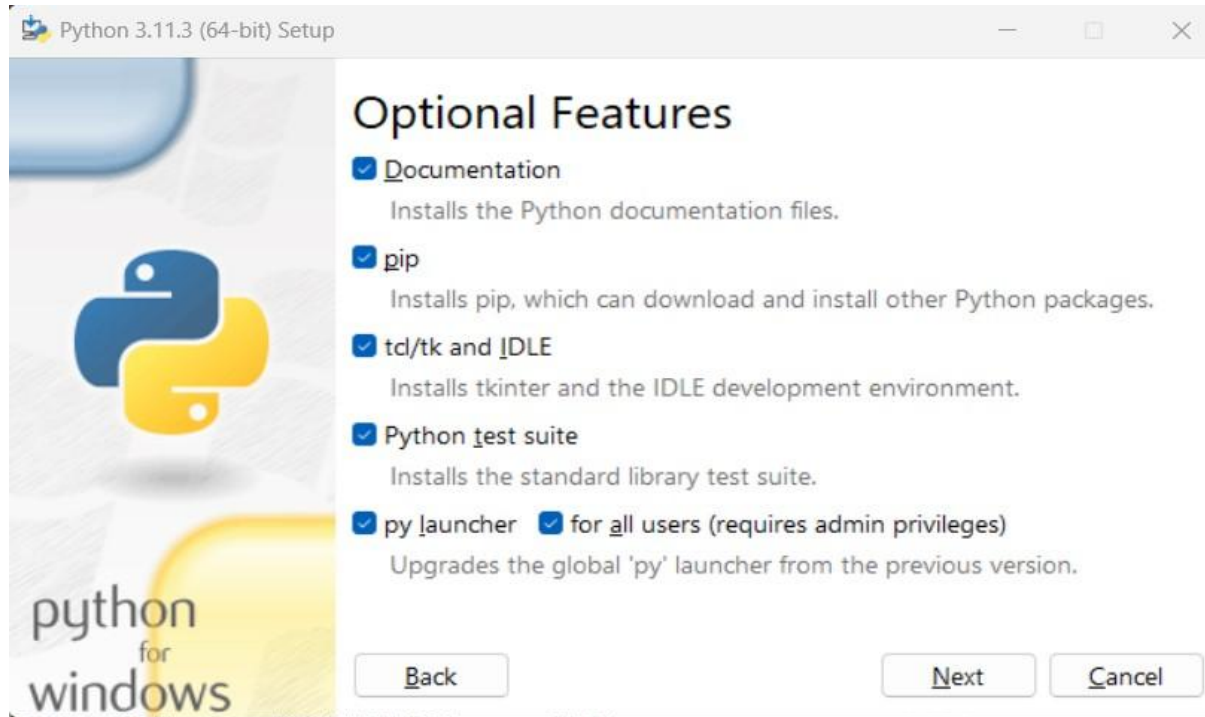
- If you want to install some advanced features (Recommended), Click **customize installation**.



Python Installation on Windows (CONTD...)



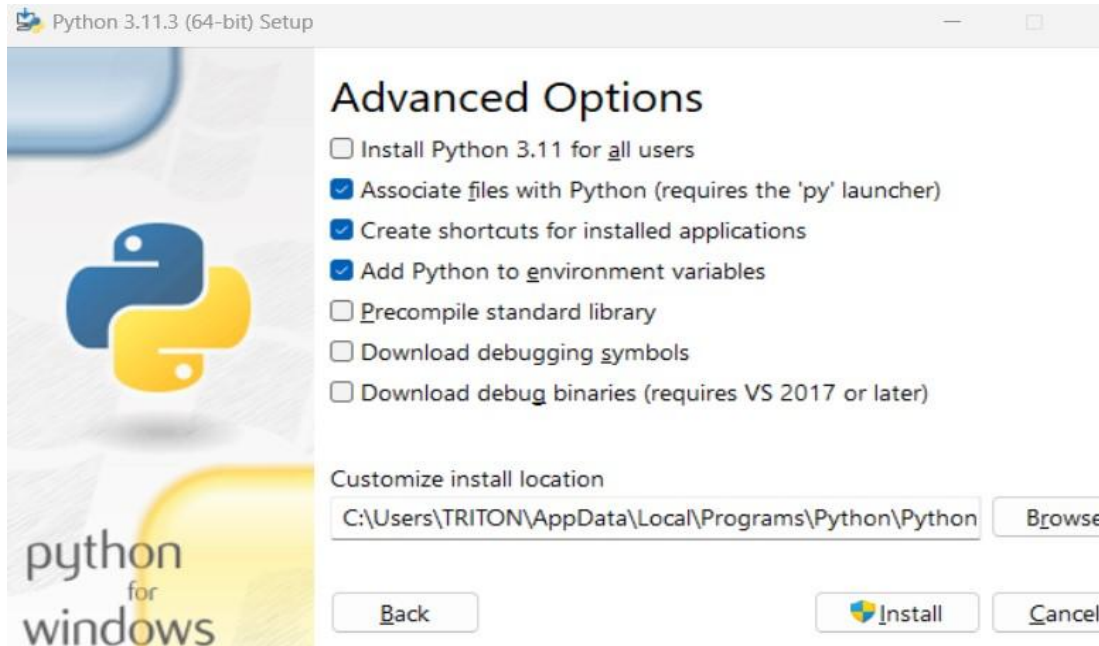
- Check all of the boxes available as shown below and click **Next**.



Python Installation on Windows (CONTD...)



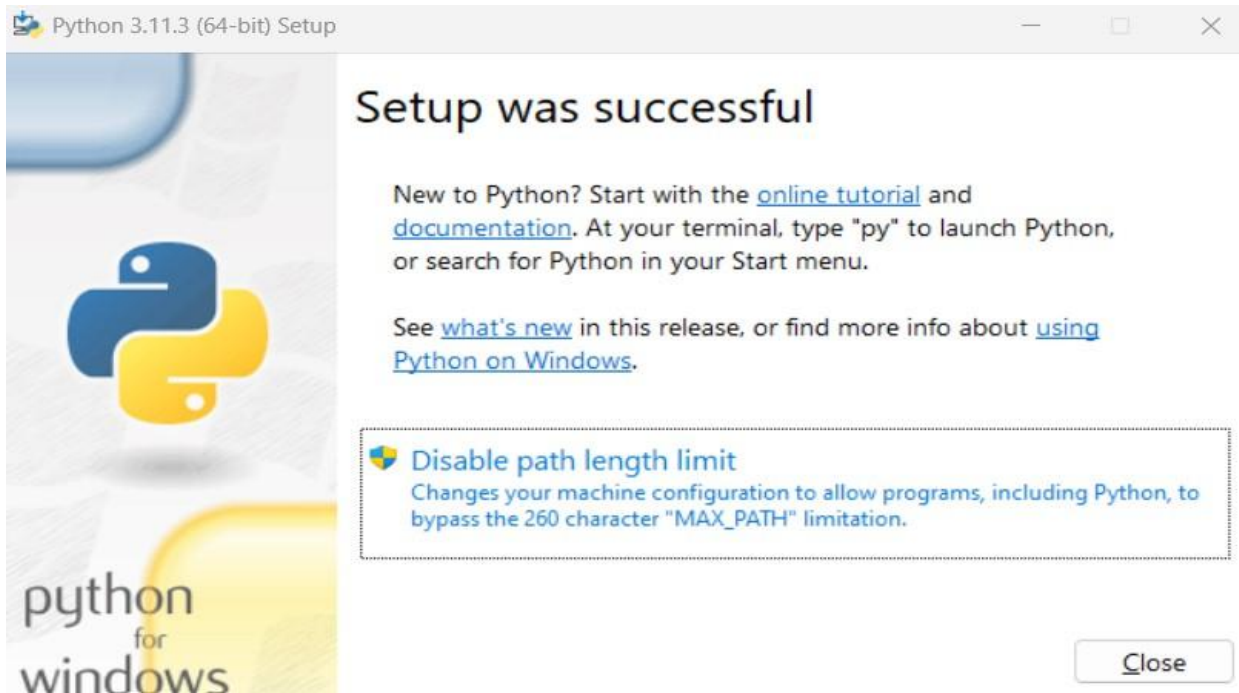
- In advanced options sections, check 2nd, 3rd, 4th checkbox as shown below and **Click Install**



Python Installation on Windows (CONTD...)



- After Installation Completes, **Setup was successful** message displays as shown:





Verify Python Installation on Windows

- Goto Start
- Open Command Prompt (cmd)
- Type python and get output as shown:

```
C:\Users\TRITON>python
Python 3.11.3 (tags/v3.11.3:f3909b8, Apr  4 2023, 23:49:59) [MSC v.1934 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>>
```



Python Installation on Linux

- Note: Linux Distribution already has python version installed.
- Installation Steps:
 - Open your terminal (Ctrl + Alt + T)
 - Update your local system's repository
 - `sudo apt update`
 - Download the latest version of python3
 - `sudo apt install python3`
 - apt will find packages, and install python in your system
 - Verify Installation, Type python3 in terminal and get output as below:

```
fm-pc-lt-125@fm-pc-lt-125:~$ python3
Python 3.8.10 (default, Mar 13 2023, 10:26:41)
[GCC 9.4.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> █
```

Download IDE



- IDE stands for Integrated Development Environment
- A software application that helps programmers develop software code efficiently.
- IDE consists of:
 - Source code editor,
 - Debugger,
 - Build automation tools
- Examples: VScode, Pycharm, Eclipse etc
- Installation VScode
 - Visit <https://code.visualstudio.com/download>
 - Download and Install for your favourite Operating System
 - Open and Run VScode



Python Pip

- PIP is package manager for Python packages, or modules.
- Uses:
 - Download a package → `pip install <package-name>`
 - List Downloaded package → `pip list` / `pip freeze`
 - Remove a package → `pip uninstall <package-name>`
- Verify Installation:
 - `pip --version`
- Note:
 - *Installing python 3.4 or later includes PIP by default*

Python package is like a directory that holds sub-packages and modules.

A python module is a file containing python code



Jupyter Notebook

- The name Jupyter is derived from Julia, Python, and R.
- Jupyter Notebook is one of the most popular tools to create and share documents that contain interactive code, visualizations, text, etc as a web applications.
- Features:
 - Interactive Environments:
 - Provides interactive computing environments to write and execute code in individual cells.
 - Rich Output:
 - Can display various types of outputs such as code, table, plots, images, etc within notebook
 - Documentation and Collaboration:
 - Supports, markdown, a markup language for creating rich-text documents.
 - Notebooks can be shared with others, enabling collaboration as well.
 - Code Execution in any order:
 - Can execute code cells in any order, rather than in sequence from top to bottom.



Installation Jupyter Notebook

- **Jupyter Notebook**
 - pip install notebook
 - jupyter notebook
- **Jupyter Lab**
 - pip install jupyter lab
 - jupyter lab
- **Notebook via Terminal**
 - pip install ipython
 - ipython

“Jupyter Lab is advanced version of Jupyter Notebook with cool features”

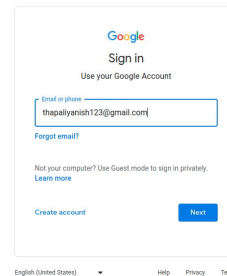
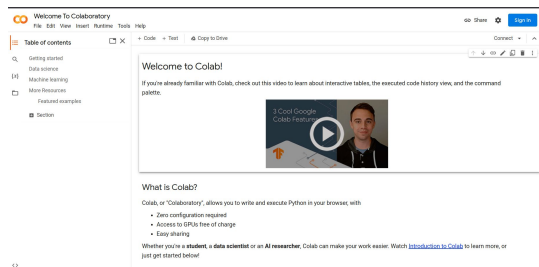


Introduction to Colaboratory

- According to documentation, Colab or Colaboratory allows you to write and execute Python in your browser.
- Features:
 - Zero configuration required
 - Access to GPUs free of charge
 - Easy sharing

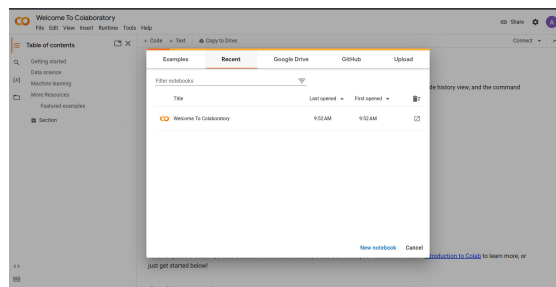


Setup Colaboratory



1. **Visit:** [Google Colab](https://colab.research.google.com/)

2. **Sign in with your credentials**



3. **Output after sign in successful**

colab



Python

Virtual Environment

(Create, Activate,
Use & Deactivate)



What is Virtual Environment?

- **Virtual environments** in python are isolated environments that allow you to create separate Python Installations and package installations for different projects.
- Structure of Virtual environments:
 1. **Directory:** Usually created within a directory, which serves as the root of the environment.
 2. **Python Interpreter:** Within virtual environment directory, there is a separated python interpreter isolated from the global Python Installation.
 3. **Site Packages:** Each virtual environment has its own site-packages directly. When you install package using pip or other package managers, they are stored in this directory.
 4. **Activate script:** To work with virtual environment, you need to activate, which can be done by executing an activate script.
 5. **Deactivate script:** Once you are done working with virtual environment, you can execute deactivate script specific to the virtual environments



Setup Virtual Environments

- **Linux:**
 - `python3 -m venv <name>`
- **Windows:**
 - `python -m venv <name>`
 - e.g. `python -m venv my_env`
- **Other Alternatives:**
 - Install virtualenv package: `pip install virtualenv`
 - Cmd: `virtualenv <name>`
- **Activate virtual environments**
 - `source <venv directory>/bin/activate`
- **Deactivate virtual environments**
 - `deactivate`



First Python Program

- A **python program** is a set of instruction that a computer uses to perform a specific task.
 - Display **Hello World** in your computer screen

```
print("Hello Word!!!")
```

← Print Statement

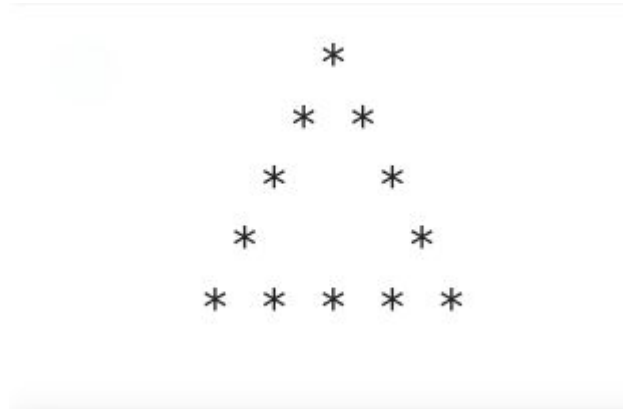
- A **python statement** is a instructions that a python interpreter can execute.
 - `print("Hello Word!!!")` is print statement





Class Work

Q. Write a python program to draw a triangle shape using print statement only.





Python as a Calculator

Operators	Operation	Example
<code>**</code>	Exponent	<code>`2 ** 3 = 8`</code>
<code>%</code>	Modulus/Remainder	<code>`22 % 8 = 6`</code>
<code>//</code>	Integer division	<code>`22 // 8 = 2`</code>
<code>/</code>	Division	<code>`22 / 8 = 2.75`</code>
<code>*</code>	Multiplication	<code>`3 * 3 = 9`</code>
<code>-</code>	Subtraction	<code>`5 - 2 = 3`</code>
<code>+</code>	Addition	<code>`2 + 2 = 4`</code>



Python as a Calculator

```
In [1]: 2 + 2  
Out[1]: 4
```

```
In [2]: 5 - 2  
Out[2]: 3
```

```
In [3]: 3 * 3  
Out[3]: 9
```

```
In [4]: 22 / 8  
Out[4]: 2.75
```

```
In [5]: 22 // 8  
Out[5]: 2
```

```
In [6]: 22 % 8  
Out[6]: 6
```

```
In [7]: 2 ** 3  
Out[7]: 8
```

“Interactive Mode”



Interactive Mode Vs Script Mode

- Interactive model is the way of executing a Python program in which statements are written in command prompt and display result in the same.
- It is suitable for writing very short programs.
- Debugging is tedious task
- Result is obtained after execution of each line of code.
- In script mode, python program is written in a file. Python interpreter reads the file, execute, display result.
- It is more suitable for writing long programs.
- Debugging is easier
- Entire program is compiled and then executed.

Python as a Calculator (Script Mode)



References

- <https://www.simplilearn.com/python-features-article>
- <https://www.python.org/downloads/>
- <https://www.geeksforgeeks.org/what-is-the-difference-between-interactive-and-script-mode-in-python-programming/>
- https://www.w3schools.com/python/python_intro.asp
- <https://www.javatpoint.com/compile-time-vs-runtime>
- <https://www.digitalocean.com/community/tutorials/install-python-windows-10>
- <https://www.makeuseof.com/install-python-ubuntu/>